



Biotechnology Experiments for India's Upcoming Space Station

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Why in News?

Recently, the [Indian Space Research Organisation \(ISRO\)](#) and the [Department of Biotechnology \(DBT\)](#) have signed an agreement to design and conduct experiments that will later be integrated with the [Bharatiya Antariksh Station \(BAS\)](#), slated for development between 2028 and 2035.

Note

The ISRO-DBT collaboration stems from another initiative this year called the [BIOE3 \(Biotechnology for Economy, Environment and Employment\) policy](#) by the Department of Biotechnology (DBT) that aims to stimulate 'bio-manufacturing' in India. The bio-economy, officials in the DBT said, would be worth USD 300 billion by 2030.

Why have ISRO and DBT Collaborated for Space Experiments?

- The **key challenges** in space missions are the continuous **availability of nutrients, preservation of food, microgravity and radiation, health hazards such as cancers, cataracts, bone and muscle loss** among others. The MoU will help address these issues using biotechnology.
- **Potential Experiments:**
 - Investigating the **effects of weightlessness on muscle loss** in astronauts.
 - Identifying **algae species that could serve as nutrients or extend food preservation.**
 - Exploring the **processing of specific algae for jet fuel production.**
 - Assessing the **impact of radiation on the health of individuals aboard space stations.**

What is Bharatiya Antariksh Station (BAS)?

- **BAS** is India's **proposed indigenous space station for scientific research.** It will be built in three phases and will have five modules.
 - The first module, known as **BAS-1**, is expected to be launched in 2028, and the station will be **fully operational by 2035.**
- **Key Details about the BAS:**
 - **Orbit:** The BAS will orbit the Earth at a height of around 400–450 kilometres.
 - **Weight:** The station will weigh about **52 tonnes.**
 - **Crew:** Astronauts will be able to stay in **orbit for 15–20 days.**
 - **Modules:** The BAS will have a crew command module, habitat module, propulsion module, and docking ports.

- **Purpose:** The BAS will be used for scientific research, including **microgravity experiments, earth observation, and fostering innovation.**
- **Collaboration:** The BAS will promote **international collaboration** with other countries and space agencies.
- **Program:** The **ISRO** will lead the program, which will also **involve industry, academia, and other national agencies.**

Other Space Stations

- **International Space Station (ISS) Context:**
 - The **ISS** has been **operational since 1998**, with collaboration from multiple countries including the US, Canada, Russia, and Japan.
 - Due to **shifting geopolitical dynamics and cost factors**, the ISS is **projected to be decommissioned by 2030**, prompting countries to consider their own space stations.
- **Tiangong:**
 - **China** has successfully established its **Tiangong space station**, which has been **fully operational since November 2022.**

Recent Major Developments in the Space Sector in India

- **Recent Major Successful Missions:**
 - [Aditya L1](#)
 - [Chandrayaan 3](#)
 - [Mars Orbiter Mission \(Mangalyaan\)](#)
 - [Gaganyaan Mission](#)
- **Advancements in Launch Vehicles:**
 - [GSLV Mark III](#)
 - [Small Satellite Launch Vehicle \(SSLV\)](#)
 - [PSLV](#)
- **Missions for International Clients:**
 - [TeLEOS-2](#) (2023): Singaporean Earth observation satellite
 - [PSLV-C51](#) (2021): Launched Brazil's Amazonia-1 satellite and 18 smaller satellites.
- **Other Key Developments:**
 - [NavIC](#)
 - [Bhuvan](#)

UPSC Civil Services Examination, Previous Year Question (PYQ)

Q. "The experiment will employ a trio of spacecraft flying in formation in the shape of an equilateral triangle that has sides one million kilometres long, with lasers shining between the craft." The experiment in question refers to (2020)

- (a) Voyager-2
- (b) New Horizons
- (c) LISA Pathfinder
- (d) Evolved LISA

Ans: (d)

Q. Consider the following statements: (2016)

1. The Mangalyaan launched by ISRO
2. is also called the Mars Orbiter Mission
3. made India the second country to have a spacecraft orbit the Mars after USA
4. made India the only country to be successful in making its spacecraft orbit the Mars in its very first attempt

Which of the statements given above is/are correct?

- (a) 1 only
- (b) 2 and 3 only
- (c) 1 and 3 only
- (d) 1, 2 and 3

Ans: (c)

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